MCDONNELL DOUGLAS CORPORATION

U.S. DEPARTMENT OF LABOR
WORKPLACE STANDARDS ADMINISTRATION
BUREAU OF LABOR STANDARDS

MATERIAL SAFETY DATA SHEET

FORM NO OSHA-20 (MODIFIED)
MAY 1971

MDC CONTROL NO. 1924

SECTION I: MATERIAL AND MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: Udylite Company - Division of Oxy Metal Finishing Corporation	EMERGENCY TELEPHONE NO.: 262-4101
ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE): 3628 E. Olympic Blvd., Los Angeles, California 90023	
CHEMICAL NAME AND SYNONYMS: Electropolishing Solution	TRADE NAME AND SYNONYMS: Battelle #30
CHEMICAL FAMILY: Inorganic Acid Mixture	FORMULA: Proprietary

SECTION II: ~~HAZARDOUS~~ INGREDIENTS*

PAINTS, PRESERVATIVES/SOLVENTS	%	TLV (UNITS)	ALLOYS AND METALLIC COATINGS	%	TLV (UNITS)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES*	%	TLV (UNITS)
Chromic Acid (CrO_3)	15-20	TFC in 0.11 mg/m
Phosphoric Acid (H_3PO_4)	75-80	TXC in 100 mg/m

SECTION III: PHYSICAL DATA

BOILING POINT (°F)	360°F	SPECIFIC GRAVITY (H_2O = 1)	1.7-1.8
VAPOR PRESSURE (mm Hg.)	---	PERCENT VOLATILE BY VOLUME (%)	NONE
VAPOR DENSITY (AIR = 1)	---	EVAPORATION RATE (______ = 1)	---
SOLUBILITY IN WATER	100%		

APPEARANCE AND ODOR: dark red-brown viscose solution, slight acid odor

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	FLAMMABLE LIMITS	Lel	Uel
NONE	---		

EXTINGUISHING MEDIA
Water

SPECIAL FIRE FIGHTING PROCEDURES
NONE, use copius amounts of water

UNUSUAL FIRE AND EXPLOSION HAZARDS
NONE

*PLEASE DO NOT USE GENERALIZATIONS, SUCH AS PETROLEUM HYDROCARBONS, ALCOHOL, KETONES. USE SPECIFIC CHEMICAL NAMES, SUCH AS METHANOL, BENZENE, PERCHLOROETHYLENE.

SECTION V: HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
See Section II

EFFECTS OF OVEREXPOSURE
Damage to skin and mucous membranes

EMERGENCY AND FIRST AID PROCEDURES
External - flush with water

Internal - give large quantities of water then milk of magnesia - report to doctor

SECTION VI: REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	XX	

INCOMPATIBILITY (MATERIALS TO AVOID)
Alkalis, reducing agents and organics

HAZARDOUS DECOMPOSITION PRODUCTS
Toxic chromium products if exposed to fire.

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	XX	

SECTION VII: SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Flush with water, neutralize with sodium carbonate.

WASTE DISPOSAL METHOD
Dilute with water, reduce hexivalent chrome with hydrosulfite and neutralize with sodium carbonate or sodium hydroxide.

SECTION VIII: SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE)
exhaust ventilation required only when solution is electrified.

VENTILATION	LOCAL EXHAUST A tank while operating	SPECIAL scrub fumes for acid and chrome
	MECHANICAL (GENERAL)	OTHER

PROTECTIVE GLOVES
yes, neoprene

EYE PROTECTION
yes, goggles

OTHER PROTECTIVE EQUIPMENT
apron, neoprene

SECTION IX: SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Do not store in excess heat or with any alkalis, organics or reducing agents. Carboys should be vented periodicly to release pressure. Vent more frequently in warm weather.

OTHER PRECAUTIONS

Oscar McDaniel
PREPARED BY

August 2, 1972
DATE

BATTELLE #30

SUPERSURFACING SOLUTION FOR STEEL

INTRODUCTION

The supersurfaced metal has distinct property advantages and is an improvement over the abrasive-finished or machine-cut surface in several important aspects. The supersurface has:

a. Freedom from mechanically damaged surface metal, stresses, slivers, and "debris" introduced by the cutting, tearing, working, etc., caused by abrasive finishing, lathe turning, grinding, broaching, etc. There is no "weak metal skin" to suffer fatigue and spall off slivers and flakes of metal, or to pit, etc., in engineering component service.

b. Freedom from the directional effect of mechanical finishing methods. (Tumbling, of course, reveals no directional effect, but is rarely used for high-quality surface finishing of shafts, pins, gear teeth, etc.

c. Easily discernable defects, so that failure of a part is forestalled, whereas abrasive finishing actually covers over defects.

APPLICATIONS FOR SUPERSURFACING

The principal applications are for engine and other mechanical parts made of expensive, special alloy steels. These alloys when fabricated require the removal of the mechanically damaged surface skin. If this is not removed the peak performance or the best wearing quality of the alloy cannot be realized. Also, it is for those parts where surface smoothnesses should be finer than 5 r.m.s. microinches, down to as fine as 0.1 microinch.

To achieve the best results by supersurfacing, the surface must be brought first to a good quality finish by mechanical means; to about 7 to 10 r.m.s. microinch finish. The steel must be relatively clean and free from local stresses, such as those introduced by careless grinding into very hard steels. Removal of the outer most surface might release stresses and produce cracking.

COMPARISON OF SUPERSURFACING TO ELECTROPOLISHING

For many applications, electropolishing in the #31 bath, as described in the bulletin on steel, will produce entirely satisfactory results. Thus, all points, except 3 and 4 in the following, direct first consideration to the #31 bath if it can possibly do the job.

a. The supersurfacing bath has a finite life and must be operated on a decant schedule along lines discussed in the stainless steel electropolishing bulletin.

b. Operating cost is higher for the supersurfacing bath; about 4 to 5 times the cost of electropolishing steels in the #31 bath (about 2 to 4 times the cost of electropolishing stainless steels).

c. The supersurface is much more rust resistant than the electropolished in the #31 bath.

d. Supersurfacing gives better results with steels that tend to be dirty or to have duplex phase structures.

e. Supersurfacing requires a shorter time, 30-90 seconds, and much higher current densities (and tank voltages) 12 to 24 amps per square inch.

f. Contamination control of the supersurfacing bath is more critical than that of the #31 bath.

PREPARATION AND MAINTENANCE OF THE SUPERSURFACING BATH

Operation

The working temperature is between 60 and 100 C. (140° to 212°F.). Current density can vary over a wide range, depending on the particular application, and C.D.'s of 200 to 2000 amperes per square foot may be used. Suitable current densities are given below:

Deburring	1,000 - 2,000 amperes per square foot
Normal Superfinishing	1,000 amperes per square foot
Descaling	250 - 500 amperes per square foot

The specific gravity of a new solution is 1.73 at 70°F. The specific gravity of a used solution is from 1.79 to 1.80 at temperatures between 70° and 75°F. Solutions above this figure should be decanted and fresh solution added.

The following is the maximum amount of dissolved solids:

Aluminum	0.1% by weight
Iron	2.7% by weight
Trivalent Chromic Oxide (Cr_2O_3)	3.0% by weight

The time of the treatment depends upon the amount of metal to be removed. The amount of metal removed is also influenced by the composition and condition of the steel being treated, and, therefore, it is necessary to check the loss experimentally where presion is required. When the dissolution rate is established for a particular C.D. and racking arrangement, it is possible to reproduce results accurately. The distribution of metal removal is, of course, influenced by the position of cathodes and/or shields, and these should be constructed and arranged with precision. Components should also be placed in the solution so that the form offers the least resistance to the flow of bath by stirring. It is important that the surfaces undergoing treatment should make the fullest possible contact with the rapidly moving liquid. Auxiliary cathodes may be aluminum or copper, particularly copper where absence of space demands a conductor with the lowest sectional resistance. Shields may be made of Bakelite or P.V.D. The protection of edges may be ensured with auxiliary anodes made of steel or aluminum, but not copper, as the anodes are attacked.

The purpose of the rapid stirring by stainless steel (Type 317) propellers is to rapidly remove the heat produced at the anode, and which, apart from spoiling the polishing effect, also decomposes chromic acid which is wasteful.

The parts are to be held on steel or aluminum racks. Copper and brass are unsuitable. The high current densities necessitate the use of stout racks and electrical contact. Where posible, contact should be made with any part of the component which is not immersed. Tapped holes or screw clamps are recommended to ensure good contact. Spring clips and magnetic jigs may also be used. In repetition work, the rack, apart from the contact surface, should be protected with P.V.C. tape, or a plastisol. Failure of the coatings is often due to faulty rack design and results in overheating.

When the iron content reaches the maximum value, further work is impossible. The iron content may be reduced by discarding a portion of the bath and adding a sufficient quantity of new solution make up the required volume.

Steel racks dissolve at about the same rate as the work and must be replaced as needed. Aluminum racks dissolve at a relatively less rate, as shown by the following table, and thus have better life than steel racks. The table shows loss on an aluminum rack to be about 1/2 the area of the steel part. The aluminum-to-steel loss ratio changes slightly as the bath becomes aged. The operating level at 2.4 to 2.7 per cent dissolved iron is the one to maintain, by discarding a small amount of used bath at 2.7 per cent iron.

RATIO OF ALUMINUM RACK LOSS TO STEEL PART LOSS IN SUPERSURFACING VS. USE OF THE BATH

Specific Gravity	Age amp-hr/l	Weight Loss, g			% Fe in Bath	Volts
		Alum	Steel	Steel/Al		
1.70	0	0.031	0.325	10	0	6.35
1.715	53	0.021	0.262	12.4	0.71	7.1
1.73	100	0.023	0.217	9.5	1.52	7.7
1.75	153	0.0301	0.183	6	2.21	9.5
1.76	192*	0.0264	0.144	5.5	2.71	9.8
1.715	192	0.039	0.186	4.8	2.89	9.1

* Amp-hr/gal. = 730

Precautions

Solution is lost by dragout, and components which have been treated should be well drained before rinsing to conserve the acids. The steel, alloy steel, or aluminum components are not attacked chemically while they are immersed in the solution.

To ensure that chromic acid is not reduced unnecessarily, it is important that, in addition to the avoidance of overheating mentioned previously, grease, copper and copper alloys should not be allowed to enter the bath. Sulphuric acid can also cause the reduction of chromic acid during the electropolishing of steel and, consequently, if a pretreatment bath containing sulphuric acid is used, thorough rinsing should be carried out before supersurfacing.

A high working temperature is necessary to ensure good agitation, a low voltage, and the retention of chromic acid in solution. A low specific gravity will cause loss of throwing power and a nonuniform removal of the metal.

Staining may be caused by a high iron content or overheating. The latter may be caused by poor contacts, faulty agitation, or too long a period of immersion. It is sometimes better to give a number of short treatments rather than a continuous treatment when heavy metal removal is required.

Persistant defects under satisfactory conditions may be associated with the material under treatment. Variations in the amount of cold deformation may cause a variation in smoothness, due to variations in structure. This effect is also noticeable on components machined from bar stocks and sections where the original surface possesses different properties from the core material exposed during machining.

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Udylite Corporation
Los Angeles